



- (D) Betriebsanleitung**
Maschinensicherheitssensor Serie 671
- (GB) Operating instructions**
Machine safety sensor series 671
- (F) Notice d'utilisation**
Capteurs de sécurité pour machines série 671
- (I) Istruzioni d'impiego**
Sensori di sicurezza per macchine serie



USL/CSL Zulassung / USL/CSL approval /
Homologation USL/CSL / Ammessi a norma USL/CSL
Environmental "Type 1"

Zertifikatnummer / Certificate number / Número certificat /
Codice certificazione

BVS 03 ATEX E 126 X*

Kennnummer TÜV / TÜV ID number / Número de certification TÜV /
Codice certificazione TÜV



Eigensichere Ausführung / Intrinsically safe model Versions á sécurité
intrinsèque / Modelli operanti a sicurezza intrinseca

 II 1G EEx ia IIC T6/T5

 II 1/2G EEx ia IIC T6/T5

 II 2G EEx ia IIC T6/T5

Vergussgekapelte Ausführung / Encapsulated model / Version enrobés /
Incapsulati nella massa di sigillature

 II 2G EEx m II T6/T5

Staubausführung / Dust model / Versions poussière / Esecuzioni polvere

 II 2D IP68 10bar T105°C

* X = Hinweis in der Baumusterprüfbescheinigung (Betriebsanleitung) auf
besondere Bedingungen für die sichere Anwendung des Gerätes

* X = Note about special conditions for the safe use of the device in the Proto-
type test Certificate (Operating Instructions)

* X = Renvoi à des conditions particulières pour une utilisation sûre de
l'appareil dans l'attestation de contrôle des modèles (instructions d'opération)

* X = Indicazione di condizioni particolari per l'utilizzo sicuro dell'apparecchio
nell'attestazione delle test di omologazione (istruzioni d'impiego)

Datum: 20.07.2004

1 Technical Specifications

1.1 Legend

The foldout shows electrical data and switching formats for the different models. In these drawings/schemes the following symbols are used:

- Electrical data
 - (A) Cable, standard, 1 m
 - (B) Earth terminal (optional)
 - (C) Operating magnet 30420000V (see Actuation magnets)
 - (D) On
 - (E) Off (one contact changed state)
 - (F) Off (all contacts changed state allowing re-start)
- Contact arrangements
 - (1-4) Wire numbers
 - (BU) Blue
 - (BN) Brown
 - (BK) Black
 - (YE) Yellow
 - (WH) White
 - (GN) Green

The following example and table shall explain the designations of the machine safety sensors:

➔ Example:

➔ 6 71 2 71 M U 0

➔ 6 ab c de f g h ij kl

	Characteristic		Meaning
6	Model	6	Ex-version Sensors
ab	Housing type	71	➔ M30 stainless steel housing (material no. 1.4571, 1.4305 or 1.4401) ➔ Resistors and reed contacts resin encapsulated ➔ Cable output with wire ends
c	Variant	2	Machine safety sensor (MSS)
		V	Machine safety sensor (MSS) two isolated contacts (4 wire)
de	Switch type	61	Three Normally Open contacts system
		62	Two Normally Open contacts system
		71	Normally Open / Normally Closed contact system
f	Ex-version	M	resin-encapsulated (EEx m); without earth terminal; for connection to non-intrinsically safe circuits
		N	resin-encapsulated; with earth terminal; for connection to non-intrinsically safe circuits
		I	intrinsically safe (EEx ia); without earth terminal; for connection to intrinsically safe circuits
		K	intrinsically safe; with earth terminal; for connection to intrinsically safe circuits

	Characteristic		Meaning
g	Cable*	1	Boflex W (PVC gray) 2 x 0.75 mm ² / 3 x 0.75 mm ² / 4 x 0.75 mm ²
		2	SIHSI (silicone red) 2 x 0.75 mm ² / 3 x 0.75 mm ²
		3	BOY11Y (PUR black) 2 x 0.75 mm ² / 3 x 0.75 mm ²
		4	LIYCYW (PVC shielded) 2 x 0.75 mm ² / 3 x 0.75 mm ² / 4 x 0.5 mm ²
		5	SXCS (silicone shielded) 2 x 0.75 mm ² / 3 x 0.75 mm ²
		U	Y-UL 2517 (PVC gray) 3 x 0.75 mm ² / 4 x 0.75 mm ²
h	Others	0	no protective conduit
		1	Protective conduit, PVC-coated metal
		2	Protective conduit, Anaconda D.L. 1/2"
ij	Others		Customer-specific
kl	Others		Extra cable length (standard: 1m)

* Optional, for intrinsically safe version:

→ blue cable coating

or

→ marked with blue heat shrink tubing

1.2 Electrical specification (sensors not operated in intrinsically safe mode)

Sensor 671 *** M** *-**, 671 *** N** *-**

<i>Type</i>	<i>671 *** M** *-**</i>	<i>671 *** N** *-**</i>
Voltage rating (V AC/DC)	24	24
Rated current (mA), static	60	150
Rated current (mA), dynamic	500 (for 2 seconds)	500 (for 2 seconds)
Power rating (W/VA)	5	5
Temperature class	T6 / T5	T6 / T5
max. ambient temperature 2G	70° C / 85° C	50° C / 70° C
max. ambient temperature 2D	85° C	70° C
Protection class	IP 68 10 bar (IEC 529)	

- Ensure that the sum of all component currents does not exceed the given current rating of the sensor.
- Ensure that the maximum rated current per switching contact does not exceed 50 mA.

1.3 Electrical specification (sensors operated in intrinsically safe mode)

Sensor 671 *** I** **_**, 671 *** K** **_**

<i>Type</i>	<i>671 *** I** **_**</i>	<i>671 *** K** **_**</i>
Voltage rating U_i (V AC/DC)	24	24
Current rating I_i (mA), static	60	150
Current rating I_i (mA), dynamic	500 for 2 seconds	500 for 2 seconds
Power P_i (mW)	500	500
Temperature class	T6 / T5	T6 / T5
max. ambient temperature	70° C / 85° C	50° C / 70° C

- Ensure that the sum of all component currents does not exceed the given current rating of the sensor.
- Ensure that the maximum rated current per switching contact does not exceed 50 mA.

Effective internal capacitance and inductance

<i>Cable length</i>	<i>≤ 10 m</i>	<i>≤ 50 m</i>	<i>≤ 100 m</i>	<i>≤ 200 m</i>
Effective internal capacitance C_i	2 nF	7 nF	12 nF	24 nF
Effective internal inductance L_i	10 μH	50 μH	100 μH	200 μH

1.4 Mechanical specification

Housing material	VA 1.4571 (alternatively VA 1.4305, 1.4401)
Cable gland	NBR (M12x1.5)
Mounting	Sensor housing has M30x1.5 external thread; for use in either a threaded hole or with lock nuts
Ambient temperature range Current rating I _i : 0 ... 60 mA	-25 °C ... 70 °C (temperature class T6) -25 °C ... 85 °C (temperature class T5) -25 °C....85 °C (II 2D)
Ambient temperature range Current rating I _i : 60 ... 150 mA	-25 °C ... 50 °C (temperature class T6) -25 °C ... 70 °C (temperature class T5) -25 °C....70 °C (II 2D)

1.5 Actuation magnets

Possible actuation magnets	304 200 00 V. 304 200 00 VH. (hygiene magnet) 304 200 00 VS. (magnet-strong) 304 200 00 SH. (hygiene magnet-strong)
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Note The switching distance can be reduced when all off-set tolerances are used (see Mounting).

Air gaps (switching distance) (mm) for safe switching function (correct operation of the elobau central control unit):

	ON		OFF		MIN.		OFF *	
Magnet	N	S	N	S	N	S	N	S
671271	≤ 4	≥ 7	> 11	> 17	≥ 0.5	≥ 3	> 16	> 23
671261	≤ 4	≥ 7	> 14	> 20	≥ 0.5	≥ 3		
671262 671V62	≤ 4	≥ 7	> 16	> 20	≥ 0.5	≥ 3		

- (N) normal magnet
 (S) strong magnet
 (MIN.) Minimum air gap
 (*) enables a system restart

Note Only use strong type magnets when an operating gap of more than 4 mm is required.

When choosing and installing the magnets:

- ➔ Observe maximum allowable opening of the guard.

1.6 Marking

The machine safety sensors are marked with an adhesive label in accordance with RL 94/9 (EC) (ATEX). Apart from the manufacturer's full address, other information is shown on the label is:

Marking	Meaning
 II 1G EEx ia IIC T6/T5  II 1/2G EEx ia IIC T6/T5  II 2G EEx ia IIC T6/T5  II 2G EEx m II T6/T5  II 2D IP68 10bar T105°C	Version
BVS 03 ATEX ****	Approval authority identification number
F-No.	Manufacturing number
CE *****	CE marking and TÜV certificate number
X	Note about special conditions for the safe use of the device in the Prototype Inspection Certificate (Operating Instructions)

Note *The intrinsically safe machine safety sensors are identified by a blue connecting cable or are marked by blue heat shrink tubing every 50 cm along the length of the cable.*

Note *Serial number and year of manufacturing are encoded in the manufacturing number (calendar week/year).*

1.7 Cable specification

Type	Operating temperature	Voltage rating	Capacitance/ inductance
PVC-UL Y-UL 2517	-30 °C ... 105 °C	300 Volt	100 pF/m 0.7 µH/m
Silicone SiHSI *	-25 °C ... 180 °C	400 Volt	60 pF/m 1 nH/m
Silicone SXCS shielded *	-25 °C ... 180 °C	400 Volt	60 pF/m 1 nH/m
PUR BOY11Y **	-40 °C ... 85 °C	250 Volt	100 pF/m 1 nH/m
PVC gray Boflex-W	-40 °C ... 105 °C	300 Volt	115 pF/m 1 nH/m
PVC gray LIYCY W shielded	-40 °C ... 105 °C	250 Volt	100 pF/m 1 nH/m

* The cable is halogen-free.

** The cable coating is halogen-free.

- Follow the applicable installation advice when installing the cables.
- At ambient temperatures lower than -5 °C, ensure the cables are properly supported.

Note The sensors are double insulated, making a ground wire unnecessary.

For category 1G and 2D:

- Only use cables tested for electrostatic discharge.

Additional advice for category 1G:

- Use shielded cables.
- Connect shielding to an earth point.

Permitted cables

Cables approved for 2D applications after electrostatic test:

<i>8th digit of part numbering system</i>	<i>Cable</i>
1	Boflex W (PVC gray) 2 x 0.75 mm ² / 3 x 0.75 mm ² / 4 x 0.75 mm ²
2	SIHSI (silicone red) 2 x 0.75 mm ² / 3 x 0.75 mm ²
3	BOY11Y (PUR black) 2 x 0.75 mm ² / 3 x 0.75 mm ²
U	Y-UL 2517 (PVC gray) 3 x 0.75 mm ² / 4 x 0.75 mm ²

Cables cleared for 1G after electrostatic test:

<i>8th digit of part numbering system</i>	<i>Cable</i>
4	LIYCYW (PVC shielded) 2 x 0.75 mm ² / 3 x 0.75 mm ² / 4 x 0.5 mm ²

2 Intended use

2.1 Application

Two types of ATEX-licensed machine safety sensors are available:

- ➔ Resin-encapsulated:
 - ➔  II 2G EEx m II T6/T5
 - ➔  II 2D IP68 10bar T105°C
- ➔ Intrinsically safe:
 - ➔  II 1G EEx ia IIC T6/T5
 - ➔  II 1/2G EEx ia IIC T6/T5
 - ➔  II 2G EEx ia IIC T6/T5

The ATEX-licensed machine safety sensors have been manufactured in compliance with the requirements of category 2 G/D. They are used in the following zones:

- ➔ 2G in zone 1
- ➔ 3G in zone 2
- ➔ 2D in zone 21
- ➔ 3G in zone 22

Intrinsically safe variants (EEx ia) conform to the requirements of category 1 G / 1/2G / 2G. With an approved safety barrier installed, the intrinsically safe models may also be used in the following zones:

- ➔ 1G in zone 0
- ➔ 1/2G in the separating wall between zone 1 and zone 0

Note The direct application of EEx ia sensors in connection with elobau central control units and a safety barrier is not possible.

- ⌚ The machine safety sensors should only be used correctly and as intended.
Any incorrect use will render all guarantees and liabilities of the manufacturer null and void.
- ⌚ In potentially explosive areas, ensure that only parts that fulfill all requirements of the relevant European directives and of national legislation are used.

To determine the temperature class in dependent upon the ambient temperature:

- ⌚ consult electrical specifications
- ⌚ Observe temperature information (see Mechanical specification).

Types

 II 1G EEx ia IIC T6/T5	671 *** *40 **_**
 II 1/2G EEx ia IIC T6/T5  II 2G EEx ia IIC T6/5	671 *** I*0 **_** 671 *** K*0 **_**
 II 2G EEx m II T6/T5	671 *** M*0 **_** 671 *** N*0 **_**
 II 2D IP68 10bar T105°	671 *** *10 **_** 671 *** *20 **_** 671 *** *30 **_** 671 *** *40 *** 671 *** *U0 **_**

2.2 Standards and Guidelines

The machine safety sensors are licensed according to RL 94/9 EC (ATEX). They have been granted a USL-/CNL license.

The hygiene magnets (VH/SH) comply with the European hygiene standard CEN/TC 153/HN108E.

The ATEX-licensed machine safety sensors conform to the following standards:

Standard	Subject
EN 50020	Electrical devices for potentially explosive areas - Inherent safety
EN 50014	Electrical devices for potentially explosive areas - General stipulations
EN 50028	Electrical devices for potentially explosive areas - resin-encapsulation
EN 50281-1-1	Electrical devices for use in areas where flammable dust is present
EN 50284	Device group II category 1G

2.3 Safety/hazards



Danger

Risk to life due to electrostatic discharge!

- Wipe plastic parts with a damp cloth only.
- Electrostatically earth all operational components.

- For EEx-m units, install suitable fuses to prevent excessive temperature rise of the machine safety sensor.
Consider the following criteria when choosing the fuse:
 - ➔ Current rating as given in the rating specifications for the switch contact / switch electronics (see Electrical specifications),
(take note of temperature class and ambient temperature)
 - ➔ Breaking capacity according to the potential short-circuit
 - ➔ current of the supply at the installation site.
- For personal protection only use with approved safety monitoring equipment.
- Observe regulations for personal safety.
- Operate the machine safety sensor only if its housing is completely undamaged.
- Do not operate a sensor if its housing is damaged in any way.
- To determine the temperature class in dependent upon the ambient temperature: see Electrical specifications.

3 Special conditions for safe use

3.1 Intrinsically safe sensors marked 1G EEx ia IIC T5/T6

- Connect the sensor housing to the earth point.
- Connect the shielding of shielded cables to the earth point.
- Protect the sensor from shock.
- Ensure that, at a current rating I_i of 60 mA ... 150 mA, the following criterion is met:
 - ➔ Temperature class T6/T5 at a maximum ambient temperature of 50 °C / 70 °C.
- Where the cable passes through a barrier wall, ensure that the cable gland seals the cable to at least IP 67 acc. to EN 60529.

When using the sensor in connection with aggressive / corrosive media:

- Test for material compatibility with the aggressive / corrosive media.

3.2 Intrinsically safe sensors marked 1/2G EEx ia IIC T5/T6

Equipment in areas of category 1G requires:

- Where the sensor is mounted through a barrier wall to 1G, (zone 0), ensure that the sensor mounting is sealed to at least IP67 acc. to EN 60529.
- Connect the sensor housing to the earth point.
- Ensure that, at a current rating I_i of 60 mA ... 150 mA, the following criterion is met:
 - ➔ Temperature class T6/T5 at a maximum ambient temperature of 50 °C / 70 °C.

When using the sensor in connection with aggressive / corrosive media:

- Test for material compatibility with the aggressive / corrosive media.
- Protect the sensor against shock.

3.3 Intrinsically safe sensors marked 2G EEx ia IIC T5/T6

- Ensure that, at a current rating I_i of 60 mA ... 150 mA, the following criterion is met:
 - ➔ temperature class T6/T5 at a maximum ambient temperature of 50 °C / 70 °C.

3.4 Encapsulated Sensors (not intrinsically safe), marked 2G EEx m II T5/T6, 2D IP68 10bar T105°C

- Connect wire ends of the sensor according to the applicable installation rules.
- Protect the sensor circuit with a fuse, taking the following criteria into consideration:
 - ➔ current rating as given in the rating specifications for the switch contact / switch electronics (see electrical specifications),
(take note of temperature class and ambient temperature)
 - ➔ breaking capacity according to the prospective short-circuit current of the supply net at the site of installation.

For category 2G applications:

- Ensure that, at a current rating I of 60 mA ... 150 mA, the following criterion is met:
 - ➔ Temperature class T6/T5 at a maximum ambient temperature of 50 °C / 70 °C.

For category 2D applications:

- Connect the metal housing of the sensor to the earth point.

4 Function

These non contacting machine safety sensors utilise reed contacts. A control unit monitors the sensor for all open and short circuits. A coded magnet is used to operate the sensor without making physical contact.

The actuation magnet approaching the machine safety sensor has the following effect (in relation to the safety output of the elobau central control unit):

<i>Distance</i>	<i>Evaluation unit</i>
$\leq a$ and ≥ 0.5 mm	On
$\geq b$	Off (cannot be switched from this position)
$\geq c$	Off (can be switched on again)

4.1 Models

The machine safety sensors differ mainly in their different connection terminals (see contact configuration on the foldout):

<i>Model</i>	<i>Contact configuration</i>
671261	Three Normally Open contacts, 4 wire
671262	Two Normally Open contacts, 3 wire
671V62	Two Normally Open contacts, 4 wire
671271	Normally Open / Normally closed contacts, 4 wire

The ATEX-licensed resin-encapsulated machine safety sensors are suitable for the following control units:

<i>Sensor</i>	<i>Evaluation unit</i>
671 261 *** **_**	463 13* 462 151G*
671 262 *** **_** 671 V62 *** **_**	462 14* E1 462 151 E1 462 1*1 H1 462 M41 H3* 462 M51 H*1
671 271 *** **_**	462 12* G1* 462 12* E1* 462 121 H* 463 12*

- ⚠ Do not use an elobau Central Control units in conjunction with intrinsically safe versions of the sensor.

5 Mounting

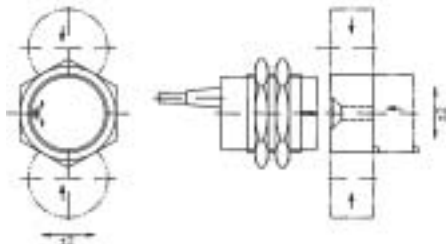


Risk to life due to improper installation!

- Ensure the sensor is installed and commissioned by specially trained and authorised personnel only.

- Note additional installation instructions (see Special conditions for safe use).
- For EEx-m units, install suitable fuses to prevent excessive temperature rise of the machine safety sensor.
Consider the following criteria when choosing the fuse:
 - ➔ Current rating as given in the rating specifications for the switch contact / switch electronics (see Electrical specifications),
(take note of temperature class and ambient temperature)
 - ➔ Breaking capacity according to the prospective short-circuit current of the supply net at the installation site.
- Ensure that only one power supply circuit (potential) is used for EEx ia applications.
- Observe standards relating to the installation of electrical devices in potentially explosive areas.
- Ensure that the mounting distance between two sensors is at least 50 mm.
- Observe markings on machine safety sensor and actuation magnets.
- Ensure that the alignment marks on both the sensor and the actuation magnet are facing each other.
Any direction of approach of the magnet to the sensor is acceptable.
- Do not install sensor and actuation magnet in ferrous material. Where necessary, use 20 mm of non ferrous spacer around the sensor.
- Use non ferrous screws for mounting the actuation magnet.
In order to prevent easy removal, a plastic socket head screw insert 351040 is recommended for socket head screws to DIN 7991/M5.
- Ensure that the sensor and actuation magnet are not installed in the presence of strong magnetic fields.
- Keep away from ferrous swarf.

- Ensure that sensors and actuation magnet are not used as mechanical stops.
- Secure sensors to prevent them from becoming loose and rotating.
- Sensors having an external thread can also be installed in a threaded socket.
- Take note of the mounting tolerance of ± 2 mm as shown:



The sensor is actuated:

- ➔ When magnet approaches directly
- ➔ When magnet approaches laterally

5.1 Connection



Danger of electric shock or gas ignition!

- Ensure the sensor is installed and commissioned by specially trained and authorised personnel only.

All connections to the sensor are by means of an integral flexible cable.

- Observe permissible limits.
- Protect cables against mechanical damage.
- Connect non-terminated, open wire ends of the sensor according to the applicable installation rules.

For sensors that are not intrinsically safe (encapsulated):

- Protect the sensor circuit with a fuse, considering the following criteria:
 - ➔ Current rating as given in the rating specifications for the switch contact / switch electronics (see electrical specifications),
(take note of temperature class and ambient temperature)
 - ➔ Breaking capacity according to the prospective short-circuit current of the supply net at the installation site.

Connection to an elobau central control unit:

- Follow the instructions for use of the central control unit.
- Observe the color coding in the circuit diagram shown on the fold-out page.

Note The EEx ia model, in connection with a safety barrier, cannot be directly connected the elobau central control unit.

5.2 Commissioning



Danger of improper handling and installation!

- Ensure the sensor is installed and commissioned by specially trained and authorised personnel only.

- Ensure that the machine safety sensor are only operated in the permitted areas (see Intended use).
- Note the specifications given on the type plate.
- Electrostatically earth all operational components when using them.

6 Maintenance

6.1 Measures

- ATEX-licensed machine safety sensors must be serviced and cleaned at regular intervals.
- Determine suitable maintenance intervals depending upon environmental conditions.
- Ensure that any servicing measures are only undertaken by elobau staff or by persons specially trained by elobau.
- Do not modify machine safety sensors.
- Replace components only by authentic replacement parts that have been approved for use in potentially explosive areas.

6.2 Disposal

- Dispose of used parts and unwanted packaging in accordance with the regulations of the country in which the device is installed.

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